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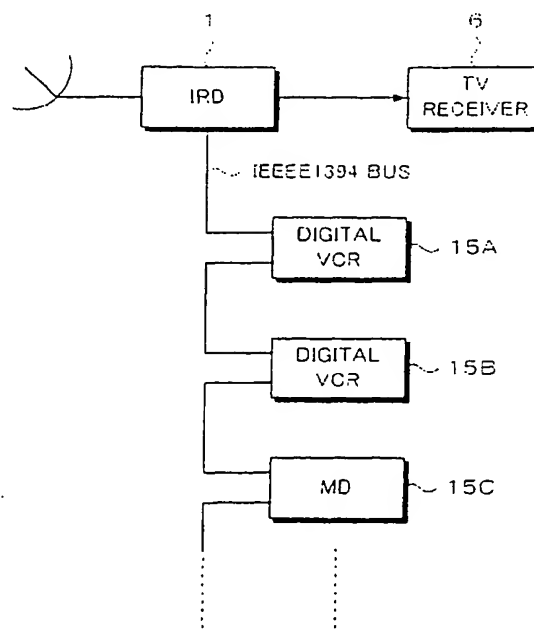
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(54) Receiving systems, methods and apparatus for digital broadcasting

(57) In a system in which an IEEE1394 interface is provided for an integrated receiver decoder (IRD), connected equipment can be easily selected and the operability is improved. Data can be transmitted among the equipment. For example, five equipment (15A, 15B, 15C, etc.) may be selected from the equipment connected to the IEEE1394 interface and node ID numbers are allocated to the five equipment and registered. Thus, even if the equipment is removed from the interface and connected again, the IRD (1) can recognize the equipment. Further, a number of equipment are not arranged on the list display of the connected equipment and desired equipment can be easily selected. Among the equipment physically connected to the interface, the five equipment which were connected early are automatically registered. The registration can be easily changed by a user input. When the registration is changed, the change of the registration is inhibited among the equipment in which the program reservation has been set or the connected equipment. Thus, even if the registration is changed, an erroneous operation does not occur.

Fig. 4



Description

[0001] The invention relates to receiving systems, methods and apparatus for digital broadcasting in which, for example, video data and audio data are broadcast by a transport stream of an MPEG (Moving Picture Experts Group) 2 system and transmitting the transport stream to digital signal processing equipment through an interface of IEEE (Institute of Electrical Electronic Engineers) 1394.

[0002] In recent years, the IEEE1394 interface has been proposed to transfer video data and audio data between digital video equipment and digital audio equipment at a high speed. In IEEE1394, an isochronous transfer mode and an asynchronous transfer mode are supported. A delay time of a data transfer is guaranteed in the isochronous transfer mode. The isochronous transfer mode is suitable to transfer a time-sequential data stream such as video data or audio data at a high speed. The asynchronous transfer mode is suitable to transfer ordinary data such as various commands or the like.

[0003] In recent years, a digital satellite broadcasting has been started to spread. In the digital satellite broadcasting, a digital video signal and an audio signal are compressed by the MPEG2 system, multiplexed by a packet stream, and transmitted. When a digital satellite broadcasting is received, an IRD (Integrated Receiver Decoder) is connected to a television receiver. A signal of a desired program is selected by the IRD and a video signal and an audio signal are decoded. An output of the IRD is supplied to the TV receiver.

[0004] A method of providing the interface of IEEE1394 for the IRD to receive such a digital satellite broadcasting has been proposed. When the interface of IEEE1394 is provided for the IRD, the IRD is connected to a digital video recording and reproducing apparatus or an MD recording and reproducing apparatus through the interface of IEEE1394 and a receiving system for the digital satellite broadcasting can be constructed.

[0005] In IEEE1394, when data is transferred, an ID number of a node is allocated and a partner is designated by the ID number of the node. There are "0" to "63" as node ID numbers which can be allocated to a bus of IEEE1394. The last node number among them is used for broadcasting. Now, assuming that the broadcast is not used, therefore, up to 63 equipment can be connected to one bus.

[0006] In case of constructing the receiving system for the digital satellite broadcasting by using the IRD having the interface of IEEE1394 as mentioned above, a method whereby the ID numbers of the nodes are allocated to up to 63 equipment in accordance with the IEEE1394 standard to thereby enable data to be transmitted among the up to 63 equipment is considered.

[0007] Generally, in the receiving system for the digital satellite broadcasting, however, it is hard to consider a situation that 63 equipment are connected to the bus

of IEEE1394 and used, and it is considered that the number of equipment which are connected to the bus of IEEE1394 is equal to or less than 5. Therefore, if a construction such that up to 63 equipment can be connected in accordance with the IEEE1394 standard is designed, a use efficiency deteriorates. For example, when the recording is set, equipment to record is selected. In this instance, if the number of equipment which can be connected is larger than the number of equipment actually used, a number of equipment are arranged on a selection display picture plane and it is difficult to designate desired equipment.

[0008] A GUI picture plane showing operations and control states of a plurality of equipment connected to a bus of IEEE1394 is disclosed in U.S.P. Nos. 5,793,366 and 5,883,621. By observing the GUI picture plane, the user can visually recognize which equipment is at present connected to the IEEE1394 bus, from which equipment and to which equipment data is transmitted, and further, to which equipment the recording is performed. According to those techniques, however, the IRD can recognize only the equipment connected to the IEEE1394 bus and, if they are once disconnected, the equipment cannot be recognized. Therefore, each time the equipment is connected to the IEEE1394 bus, the equipment that is connected has to be set and recognized.

[0009] It is, therefore, an aim of at least an embodiment of the invention to provide a receiving apparatus for digital broadcasting, in which when a plurality of equipment are connected to the interface of IEEE1394, the operability is improved and the equipment connected to the interface of IEEE1394 are disconnected, and even if they are connected again, the equipment can be recognized without setting the equipment which is connected.

[0010] According to the invention, there is provided a receiving apparatus for a digital broadcasting for receiving a digital broadcasting which is transmitted by a transport stream in which video data and audio data have been compressed and multiplexed, comprising: a decoder for decoding the transport stream; a digital interface for transmitting and receiving the transport stream to/from digital signal processing equipment; and a register for selecting a predetermined number of equipment among a plurality of digital signal processing equipment connected to the digital interface and allocating ID numbers to the selected equipment.

[0011] Although up to 63 equipment can be connected to the interface of IEEE1394, for example, five equipment may be selected among them and node ID numbers are allocated to the selected five equipment and registered. Thus, the equipment can be easily selected.

[0012] The invention will now be described by way of example with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Fig. 1 is a schematic diagram of an example of a receiving system for a digital satellite broadcasting to which the invention may be applied;

Fig. 2 is a rear view showing a rear panel of an IRD in the receiving system for a digital satellite broadcasting to which the invention may be applied;

Fig. 3 is a block diagram showing a construction of the IRD in the receiving system for a digital satellite broadcasting to which the invention is applied;

Fig. 4 is a block diagram for use in explanation of the receiving system for a digital satellite broadcasting to which the invention is applied;

Fig. 5 is a schematic diagram for use in explanation of a control panel display in the IRD in the receiving system for a digital satellite broadcasting to which the invention is applied;

Figs. 6A and 6B are schematic diagrams for use in explanation of a setting display in the IRD in the receiving system for a digital satellite broadcasting to which the invention is applied;

Figs. 7A to 7C are schematic diagrams for use in explanation of a setting display in the IRD in the receiving system for a digital satellite broadcasting to which the invention is applied;

Figs. 8A and 8B are flowcharts for use in explanation of a registration of equipment in the receiving system for a digital satellite broadcasting to which the invention is applied;

Fig. 9 is a flowchart for use in explanation of a registration of equipment in the receiving system for a digital satellite broadcasting to which the invention is applied; and

Fig. 10 is a schematic diagram for use in explanation of broadcasting in the receiving system for a digital satellite broadcasting to which the invention is applied.

[0013] An embodiment of the invention will now be described hereinbelow with reference to the drawings. In Fig. 1, reference numeral 1 denotes an IRD. The IRD 1 decodes a reception signal of a digital satellite broadcasting and forms a video signal and an audio signal of, for example, the NTSC system. An antenna terminal of the IRD 1 is connected through a cable 2 to a low-noise converter 4 attached to a parabolic antenna 3. A radio wave from a satellite is transmitted by, for example, a band of 12 GHz. The radio wave from the satellite is received by the parabolic antenna 3 and converted into a signal of, for example, a band of 1 GHz by the low-noise converter 4 attached to the parabolic antenna 3.

[0014] An output of the low-noise converter 4 is supplied to the antenna terminal of the IRD 1 through the cable 2. In the IRD 1, a signal of a desired carrier wave is selected from the reception signal and a transport stream of MPEG2 is demodulated. A video packet and an audio packet of a desired program are extracted from the transport stream and decoded. For example, the video signal and audio signal of the NTSC system are de-

coded.

[0015] The video signal and audio signal from the IRD 1 are supplied to a television receiver 6 through a cable 5. A reception picture plane of a desired satellite broadcasting program is displayed and its audio sound is generated by the TV receiver 6.

[0016] An IC card 7 is inserted into the IRD 1. Reception information is stored into the IC card 7. The IRD 1 is connected to a telephone line distributor 8 through a cable 9 and charging information is sent to the IRD 1 through a telephone line.

[0017] The IRD 1 is operated by a remote controller 11. When a video mouse 10 is attached, the user can set a reservation program while observing the picture plane which is displayed to the TV receiver 6.

[0018] As shown in Fig. 2, a rear panel of the IRD 1 is equipped with: terminals 21A and 21B of IEEE1394; an optical digital audio output terminal 22; an MD mouse terminal 23; analog audio output terminals 24A to 24D; video output terminals 25A and 25B; S video output terminals 26A and 26B; and a data output high-speed parallel terminal 27.

[0019] The terminals 21A and 21B of IEEE1394 are provided to perform a data transfer by using the interface of IEEE1394. An isochronous transfer mode and an asynchronous transfer mode are supported in IEEE1394. A delay time of a data transfer is guaranteed in the isochronous transfer mode. In the isochronous transfer mode, a time-sequential data stream such as video data or audio data can be transferred at a high speed. In the asynchronous transfer mode, data such as various commands or the like is transferred.

[0020] A digital audio signal is outputted from the optical digital audio output terminal 22 by using an optical cable of IEC958. The optical digital audio output terminal 22 is used to connect digital audio equipment or the like having the optical cable of IEC958. The analog audio output terminals 24A to 24D are used to output an analog audio signal. The video output terminals 25A and 25B and S video output terminals 26A and 26B are used to output a demodulated video signal.

[0021] Fig. 3 shows a construction of the IRD 1. As shown in Fig. 1, a radio wave of a digital satellite broadcasting sent by a radio wave of a band of, for instance, 12 GHz through a satellite is received by the parabolic antenna 3 and converted into a signal of a band of 1 GHz by the low-noise converter 4 attached to the parabolic antenna 3. An output of the low-noise converter 4 is supplied to an antenna terminal 31 of the IRD 1 through the cable 2. A signal from the antenna terminal 31 is supplied to a tuner circuit 32.

[0022] The tuner circuit 32 comprises: a frequency selecting circuit to select a signal of a predetermined carrier frequency from the reception signal; a demodulating circuit for performing a QPSK (Quadrature Phase Shift Keying) demodulating process; and an error correction processing circuit. In the tuner circuit 32, a signal of a desired carrier frequency is selected from the reception

signal on the basis of a setting signal from a control CPU (Central Processing Unit) 33. The reception signal is QPSK (Quadrature Phase Shift Keying) demodulated and, further, subjected to an error correcting process.

[0023] An output of the tuner circuit 32 is supplied to a descrambler 34. Received ECM (Entitlement Control Message) data and EMM (Entitlement Management Message) data are inputted to a descrambler 34. Key data for descrambling stored in the IC card 7 inserted in an IC card slot 36 is also supplied. The descrambler 34 descrambles an MPEG transport stream by using the received ECM data and EMM data and the key data of the IC card 7. The descrambled transport stream of MPEG2 is sent to a demultiplexer 37.

[0024] The demultiplexer 37 separates a desired packet from the stream from the descrambler 34 on the basis of a command from the CPU 33. A packet identifier (PID) is provided in a header portion of the transmitted packet. The demultiplexer 37 extracts a video packet and an audio packet of a desired program on the basis of the PID. The video packet of the desired program is sent to an MPEG2 video decoder 38. The audio packet is sent to an MPEG audio decoder 39.

[0025] The MPEG2 video decoder 38 receives the packet of the video signal from the demultiplexer 37 and performs a decoding process of the MPEG2 system, thereby forming video data. The video data is supplied to an NTSC converting circuit 40. In the NTSC converting circuit 40, the video data decoded by the MPEG2 video decoder 38 is converted into a video signal of the NTSC system.

[0026] A display control circuit 51 and a copy inhibition control circuit 52 are provided for the NTSC converting circuit 40. The display control circuit 51 allows various display picture planes to be generated on a screen. The copy inhibition control circuit 52 generates a copy inhibition control signal as necessary in order to protect the copyright of a video image.

[0027] An output of the NTSC converting circuit 40 is supplied to the analog video output terminals 25 and S video output terminals 26. An analog video signal of the NTSC system is outputted from the analog video output terminals 25 and an S video signal is outputted from the S video output terminals 26.

[0028] The MPEG audio decoder 39 receives the audio packet from the demultiplexer 37 and performs an audio decoding process of the MPEG system, thereby forming audio data before data compression. The decoded audio data is outputted from the optical digital audio output terminal 22 through an IEC958 interface circuit 55, converted into an analog audio signal by a D/A converter 53, and thereafter, supplied to the analog audio output terminals 24.

[0029] An input to the IRD 1 is supplied from an input unit 46. The remote controller 11, a video mouse, or the MD mouse 10 is prepared as an input unit 46. A modem 45 is provided and charging information is sent by the modem 45 via a telephone line.

[0030] A carrier frequency of the reception signal is set on the basis of a channel setting signal inputted by the viewer. When a desired program is set, a receiving frequency of the tuner circuit 32 is set to a predetermined carrier frequency by referring to an NIT (Network Information Table). A packet of the PID in a PMT (Program Map Table) as information regarding a desired channel is extracted with reference to a PAT (Program Association Table) as information regarding a channel at the carrier frequency. The video image, audio sound, and PID of a packet of additional data of a desired channel are obtained by referring to the PMT.

[0031] An interface 44 of IEEE1394 is provided for the IRD 1. A transport stream or PCM audio data can be inputted and outputted between the demultiplexer 37 and interface 44 of IEEE1394.

[0032] An interface 56 for high-speed parallel data is further provided for the IRD 1. The transport stream or PCM audio data can be inputted and outputted through the high-speed parallel data interface 56.

[0033] As mentioned above, the interface 44 of IEEE1394 is provided for the IRD 1 to which the invention is applied. By using the interface 44 of IEEE1394, as shown in Fig. 4, other digital equipment 15A, 15B, 15C, ... which can perform the digital recording, for example, a digital video recording and reproducing apparatus, an MD recording and reproducing apparatus, and the like are connected to the IRD 1.

[0034] In IEEE1394, there are "0" to "63" as node ID numbers. The last node number "63" among them is used as a broadcasting channel. The ID number of the node is automatically allocated when the equipment is connected to the bus of IEEE1394. In this instance, up to five equipment among the equipment connected to the bus are registered and the ID numbers of the nodes are allocated to the registered equipment and stored into a nonvolatile memory 60 in correspondence to the registered equipment. The number of corresponding equipment which are connected is limited to 5 or less.

[0035] The registered equipment can be changed by shifting the picture plane from a display of a control panel as shown in Fig. 5 to a picture plane for changing the setting by pressing a "set" button 66. In the display of the control panel, there are provided: an equipment selection display 61; a "function" button display 62; a state display 63; a "power" button 64; a "record" button 65; a "set" button 66; an IEEE1394 input switching button 67 (IEEE1394 is displayed as i.LINK); and a "smart file" executing button 68. Names of the five registered equipment of IEEE1394 are shown in the equipment selection display 61. Desired equipment which the user wants to connect to the bus of IEEE1394 can be selected from the five equipment by the equipment selection display 61.

[0036] When the "set" button 66 is pressed from the display of the control panel, a setting picture plane as shown in Figs. 6A and 6B is displayed.

[0037] As shown in Fig. 6A, a registered equipment

display 71, a connected equipment display 72, a "decide" button 73, and a "return" button 74 are displayed on a set changing picture plane.

[0038] Up to five equipment to which the ID numbers were allocated as nodes of IEEE1394 are displayed in the registered equipment display 71. The equipment displayed brightly among them denotes the equipment connected physically to the bus. When the registered equipment is disconnected from the bus, the display of the registration name becomes dim. When the registered equipment is connected again to the bus, the display of the registration name becomes bright.

[0039] As for the five equipment which are connected through the bus of IEEE1394, five equipment which were connected early are first automatically registered. If five equipment have already been registered, the sixth and subsequent equipment are not registered.

[0040] In case of changing or removing the equipment which is connected through the bus of IEEE1394, a check mark is added to a check box 72A in the connected equipment display 72. The equipment to which the check mark has been added becomes a target of registration. The equipment to which the check mark is not added is removed from a target of registration. In this instance, the equipment in which the reservation recording has been set and the connected equipment cannot be changed. This is because if the equipment in which the reservation recording has been set and the connected equipment are removed, an inconvenience such that the reservation recording cannot be performed or data cannot be transmitted occurs.

[0041] As shown in Fig. 6B, for instance, a reservation mark 75 like a clock mark is displayed on the equipment in which the reservation recording has been set. In the equipment in which the reservation mark 75 has been displayed, the check mark of the check box 72A cannot be removed.

[0042] Figs. 7A to 7C show processes in case of changing the registered equipment and show a case where, for example, the equipment of D-VHS2 is changed to the equipment of MD3. As shown in Fig. 7A, first, a cursor is moved to a position of the equipment of D-VHS2. Subsequently, the "decide" button 73 is pressed. When the "decide" button 73 is pressed at this position, the check mark of D-VHS2 is removed as shown in Fig. 7B. After that, the cursor is moved to a position of equipment which the user wants to newly register. The "decide" button 73 is pressed at this position. Thus, the check mark is added to the position of MD3 as shown in Fig. 7C. After the check mark is changed and the setting picture plane is finished by pressing the "return" button 74 in this manner, the equipment to which the check mark has newly been added is registered.

[0043] The expression of "VHS", "MD", or the like shows the kind of equipment. When the same kind of equipment is registered, the equipment is identified by the number written after such an expression. When the registration of the equipment is changed, the number

subsequent to the expression showing the kind of equipment is changed in accordance with the change.

[0044] Figs. 8A and 8B are flowcharts for performing the processes as mentioned above and show an automatic registering process of equipment. As shown in Fig. 8A, when the equipment is connected, whether the number of connected equipment is equal to or larger than 64 or not is discriminated (step S1). If the number of connected equipment is equal to or larger than 64, it is determined that there is a bus error (step S2). The processing routine is finished. If the number of equipment connected to the bus is smaller than 64 in step S1, whether the number of registered equipment is equal to or less than 5 or not is discriminated (step S3). If the number of registered equipment is larger than 5, the ID numbers of the nodes and the equipment names are not registered (step S4). The processing routine is finished.

[0045] If the number of equipment connected to the bus is equal to or less than 5 in step S3, the unique ID numbers of the nodes of the equipment connected to the bus are discriminated (step S5). The registration contents stored in the nonvolatile memory 60 are discriminated and whether there is the equipment having the ID number among the registered equipment or not is discriminated (step S6).

[0046] If the equipment having the same ID number as that of the connected equipment cannot be found out among the registered equipment, the ID number and the equipment name are newly registered (step S7). This equipment name is brightly displayed (step S8).

[0047] If the equipment having the same ID number as that of the connected equipment exists among the registered equipment, the name of the registered equipment is allocated (step S9). This equipment name is brightly displayed (step S8).

[0048] As shown in Fig. 8B, when the connected equipment is disconnected from the bus of IEEE1394 and enters a non-connecting state, the equipment name is darkly displayed (step S10).

[0049] Fig. 9 is a flowchart showing processes when the registered equipment is changed. In Fig. 9, when the equipment is selected and the "decide" button 73 is pressed (step S21), whether the check mark has been added so far or not is discriminated (step S22).

[0050] If the check mark is not added so far, whether the check marks have been added to five equipment or not is discriminated (step S23). If the check marks are not added to five equipment, the check marks are added to those equipment (step S24). A check is made to see if the setting picture plane is finished (step S25). If the setting picture plane is not finished, the processing routine is returned to step S21.

[0051] If it is decided in step S23 that the check marks have been added to the five equipment, the check marks are not changed but step S25 follows and whether the setting picture plane is finished or not is discriminated. If the setting picture plane is not finished, the processing routine is returned to step S21.

[0052] If it is decided in step S22 that the check marks have been added so far, whether the program reservation has been made to the equipment or not is discriminated (step S26). Since the registration is not reset in the equipment in which the program has been reserved, if it is the reserved equipment, the check marks are not changed but step S25 follows. Whether the setting picture plane is finished or not is discriminated. If the setting picture plane is not finished, the processing routine is returned to step S21.

[0053] If it is decided in step S26 that the equipment is not the reserved equipment, whether the equipment has been connected or not is discriminated (step S27). Since the registration cannot be reset in the connected equipment, in case of the connected equipment, the check marks are not changed but step S25 follows and whether the setting picture plane is finished or not is discriminated. If the setting picture plane is not finished, the processing routine is returned to step S21.

[0054] If it is determined in step S27 that the equipment is not the connected equipment, whether the number of equipment connected to the bus is equal to or larger than 6 or not is discriminated (step S28). Since up to five equipment can be registered, if six or more equipment are not connected to the bus, the check marks are not changed but step S25 follows and whether the setting picture plane is finished or not is discriminated. If the setting picture plane is not finished, the processing routine is returned to step S21.

[0055] When it is decided in step S28 that the number of connected equipment is equal to or larger than 6, the check marks are removed (step S29). Whether the cable has been disconnected or not is discriminated (step S30). If the cable is disconnected, the equipment is deleted from the list (step S31). If the cable is not disconnected, step S25 follows and whether the setting picture plane is finished or not is discriminated. If the setting picture plane is not finished, the processing routine is returned to step S21.

[0056] By the processes as mentioned above, when the equipment is selected and the "decide" button 73 is pressed, if the check marks have been added so far, the check marks are removed. If no check mark is added, the check mark is added. At this time, the reserved equipment or connected equipment is controlled so as not to remove the check mark. The number of equipment to which the check marks have been added is controlled to become 5.

[0057] When the "return" button 74 is pressed in step S25, the setting picture plane is finished and the screen is returned to the control panel. In this instance, whether the check marks have been added to the five equipment or not is discriminated (step S32). If the check marks have been added to the five equipment, the five equipment with the check marks are registered (step S33). If the check marks are not added to the five equipment, the five equipment checked just before are registered (step S34).

[0058] The broadcasting channel of the ID No. "63" can be used for preparation for a case where undefined equipment is connected. In the broadcasting channel, the transport packet of MPEG and the PCM audio data can be selected. Now, assuming that the bus output of IEEE1394 at the time of non-connection is an MPEG stream, the MPEG transport stream is transmitted by the broadcasting channel. Now, assuming that the bus output of IEEE1394 at the time of non-connection is a PCM audio stream, the PCM audio data is transmitted by the broadcasting channel.

[0059] Fig. 10 shows a picture plane for initial setting of IEEE1394. As shown in Fig. 10, a selection display 81 to discriminate whether a power source of partner equipment is turned on at the time of connection or not, a selection display 82 to discriminate whether the partner equipment is set to an IEEE1394 input upon connection or not, and a selection display 83 to discriminate whether a bus output of IEEE1394 upon non-connection is set to the MPEG stream or PCM audio data are displayed on the initial setting picture plane. When the MPEG stream side is selected on the selection display 82, the transport stream of MPEG is transmitted in the broadcasting channel. When the PCM audio is selected, the PCM audio data is transmitted in the broadcasting channel.

[0060] As mentioned above, the MPEG transport stream and the PCM audio data can be selected in the broadcasting channel. That is, the video data, audio data, and control data compressed by the MPEG system can be transmitted by a packet of the MPEG transport stream. Even in case of the other data, data which is multiplexed to the transport stream can be transmitted by a packet of the transport stream. Data such that a compression system differs from the MPEG system as in case of the MD recording and reproducing apparatus can be transmitted as PCM audio data.

[0061] In the system to which the invention is applied as mentioned above, the number of equipment which are connected to the bus of IEEE1394 is limited to 5. The names of the five equipment registered are displayed on the equipment selection display 61. Desired equipment can be selected from the five equipment by the input switching button 67. The equipment to be registered can be easily changed by the setting picture plane.

[0062] Although the number of equipment of IEEE1394 which are registered has been set to 5 in the above example, it is not limited to this value.

[0063] In the above example, when the registration of the equipment is changed, the change of the registration is inhibited in the equipment in which the program reservation has been set or the connected equipment. However, the invention is not limited to such a construction. For example, the change of the registration can be also inhibited by generating a warning display such as "The program recording reservation has been set in the equipment to be changed.", "The equipment to be

changed has been connected.", or the like. Such a warning display can be merely performed without inhibiting the registration.

[0064] According to the invention, for example, five equipment are selected from the equipment connected to the interface of IEEE1394 and the node ID numbers are allocated to the five equipment and registered. By registering them as mentioned above, even if the equipment is disconnected from the interface and connected again, the IFD can recognize the equipment. Further, a number of equipment are not arranged on the list display of the connected equipment and the equipment can be easily selected.

[0065] Among the equipment physically connected to the interface, the five equipment which were connected early are automatically registered. The registration contents can be easily changed by the user input. When the registration contents are changed, the change of registration is inhibited in the equipment in which the program reservation has been set or the connected equipment. Thus, even if the registration is changed, an erroneous operation does not occur.

[0066] The present invention is not limited to the foregoing embodiments but many modifications and variations are possible within the scope of the appended claims.

Claims

1. A receiving apparatus for a digital broadcasting for receiving a digital broadcasting which is transmitted by a transport stream in which video data and audio data have been compressed and multiplexed, comprising:

a decoder for decoding said transport stream;
a digital interface for mutually transmitting and receiving the transport stream to/from digital signal processing devices; and
a register for selecting a predetermined number of devices among a plurality of digital signal processing devices connected to said digital interface and allocating identification numbers to said selected devices.

2. An apparatus according to claim 1, wherein said register stores the identification numbers allocated to said selected digital signal processing devices and maintains a registration, whether said selected digital signal processing devices has been connected to said digital interface or not.

3. An apparatus according to claim 1, wherein said register confirms whether the device which is connected has already been registered together with the identification number, or not when said digital signal processing device is connected to said digital

interface.

4. An apparatus according to claim 1, wherein said register automatically registers said predetermined number of devices which were first connected among the devices connected to said digital interface.

5. An apparatus according to claim 1, wherein said register can change the contents of registration by a user input.

6. An apparatus according to claim 1, wherein in case of the devices in which a program recording reservation has been set or the connected devices among the equipment which have previously been registered, said register prohibits a cancellation of a registration.

7. An apparatus according to claim 1, further comprising a display processing circuit for displaying a list of said registered devices.

8. An apparatus according to claim 7, wherein said display processing circuit for displaying the list of said registered devices displays so that the devices connected to said digital interface and the devices which are not connected among the registered devices can be visually discriminated.

9. An apparatus according to claim 7, wherein in the case where a changing operation of the registration is performed to the devices in which a program recording reservation has been set or the connected devices among the devices which have previously been registered by said register, said display processing circuit performs a predetermined warning display.

10. An apparatus according to claim 1, further comprising display means for displaying a selection screen to select devices from said registered devices.

11. A recognizing method of digital signal processing devices connected to a digital broadcasting receiving apparatus through a digital interface, comprising:

a selecting step of selecting a predetermined number of devices from a plurality of digital signal processing devices which are connected to said digital interface; and
a registering step of allocating identification numbers to the devices selected in said selecting step.

12. A method according to claim 11, wherein in said registering step, the identification numbers allocated to

said selected digital signal processing devices are stored and registered, whether said selected digital signal processing devices have been connected to said digital interface or not.

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13. A method according to claim 11, wherein in said registering step, when said digital signal processing device is connected to said digital interface, whether the device to be connected has already been registered together with the identification number or not is confirmed. 10
14. A method according to claim 12, wherein in said registering step, said predetermined number of devices which were first connected among said devices connected to said digital interface are automatically registered. 15
15. A method according to claim 11, wherein in said registering step, the contents of registration can be changed by a user input. 20
16. A method according to claim 11, wherein in said registering step, in case of the devices in which a program recording reservation has been set or the connected devices among the devices which have previously been registered, a cancellation of a registration is prohibited. 25
17. A method according to claim 11, further comprising a display processing step of displaying a list of said registered devices. 30
18. A method according to claim 17, wherein in said display processing step of displaying the list of said registered devices, said list is displayed so that the devices connected to said digital interface and the devices which are not connected among the registered devices can be visually discriminated. 35
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19. A method according to claim 17, wherein in said display processing step, in the case where a changing operation of the registration is performed to the devices in which a program recording reservation has been set or the connected equipment among the devices which have previously been registered in said register, a predetermined warning display is performed. 45
20. A method according to claim 11, further comprising a display processing step of displaying a selection screen to select devices from said registered devices. 50

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Fig. 1

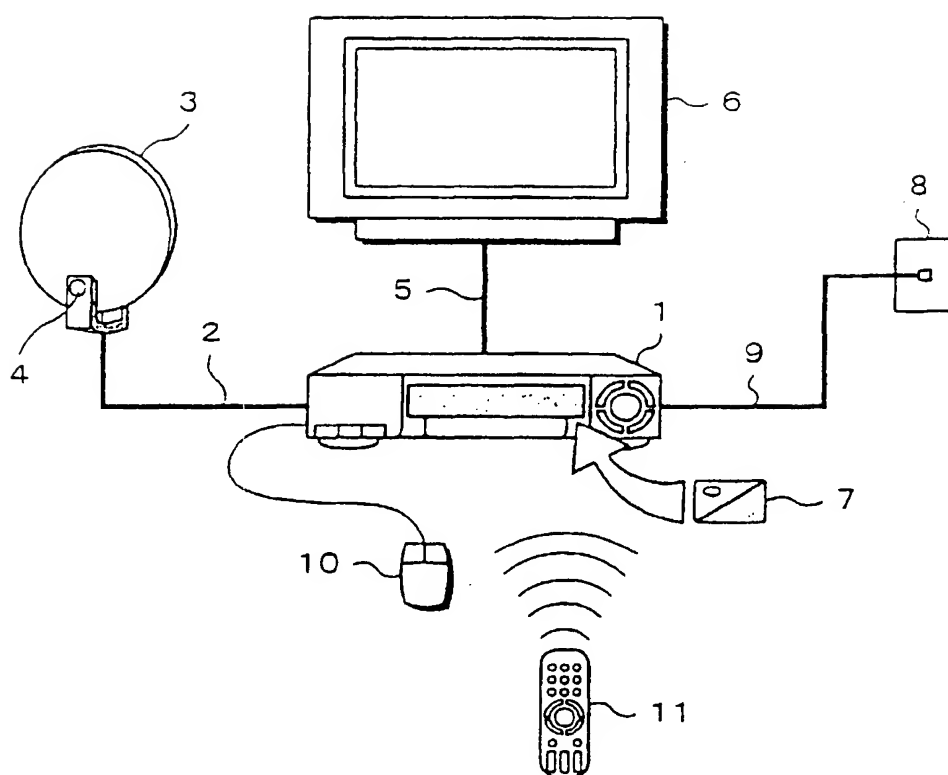


Fig. 2

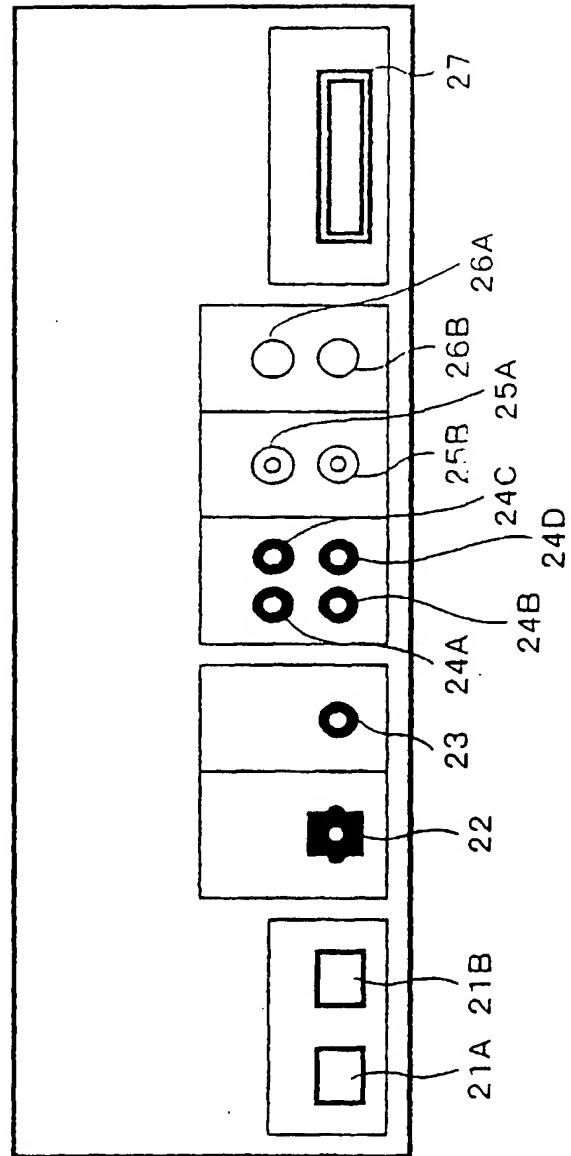


Fig. 3

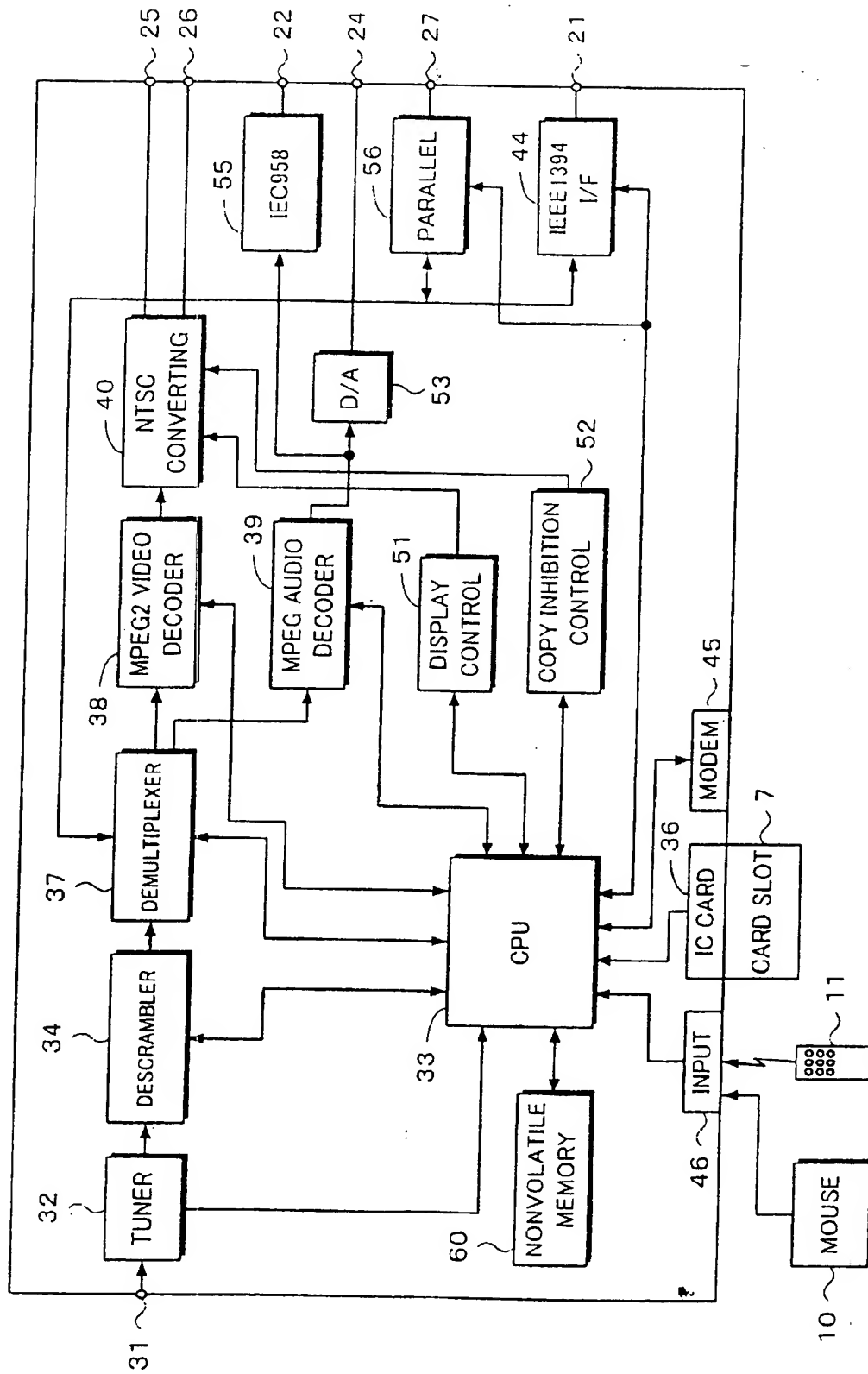


Fig. 4

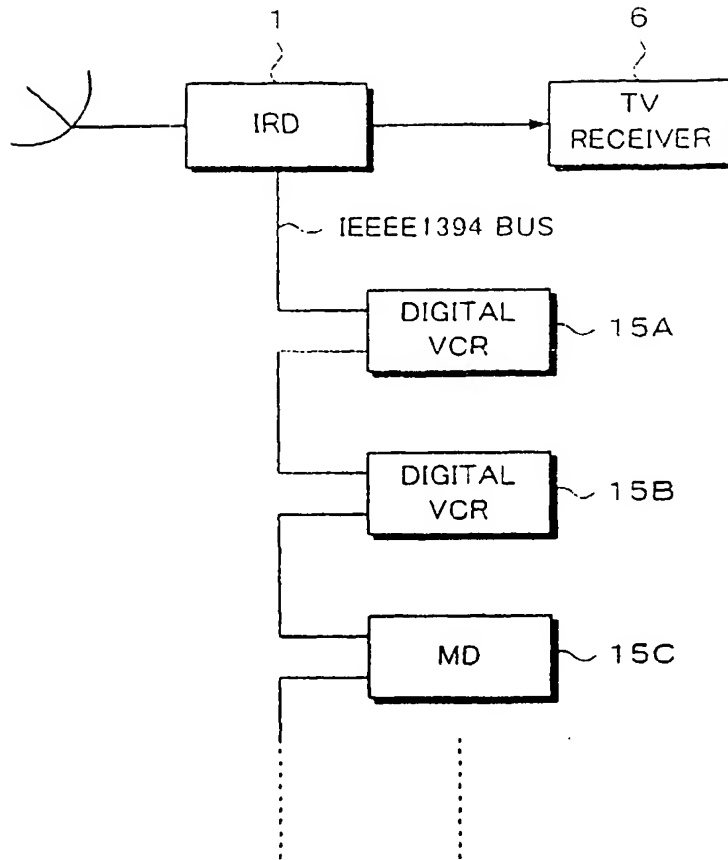


Fig. 5

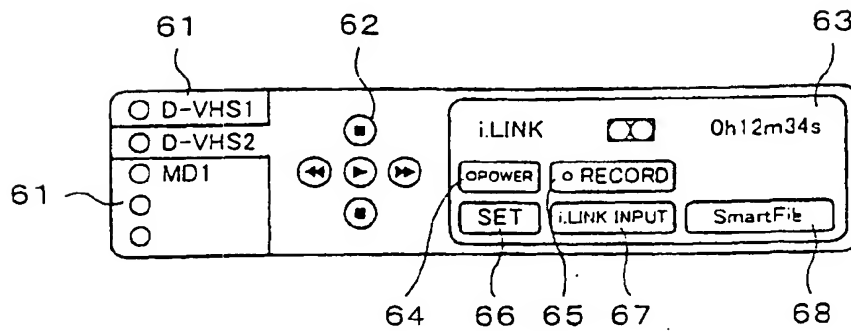


Fig. 6A

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SET EQUIPMENT			
<input checked="" type="checkbox"/> D-VHS1	ABC	DVX-10000	
<input checked="" type="checkbox"/> D-VHS2	DEF		
<input checked="" type="checkbox"/> D-VHS3	GHI	DVX-10000	
<input type="checkbox"/> D-VHS	ABC	DVX-10000	
<input type="checkbox"/> D-VHS	DEF		
<input checked="" type="checkbox"/> MD1	ABC	DVX-10000	
<input checked="" type="checkbox"/> MD2	GHI	DVX-10000	
<input type="checkbox"/> MD	ABC	DVX-10000	
<input type="checkbox"/> PC	CANNOT BE OPERATED		

DECIDE

RETURN

Fig. 6B

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SET EQUIPMENT			
<input checked="" type="checkbox"/> D-VHS1	ABC	DVX-10000	
<input type="checkbox"/> D-VHS2	DEF		
<input checked="" type="checkbox"/> D-VHS3	GHI	DVX-10000	
<input type="checkbox"/> D-VHS	ABC	DVX-10000	
<input type="checkbox"/> D-VHS	DEF		
<input checked="" type="checkbox"/> MD1	ABC	DVX-10000	
<input checked="" type="checkbox"/> MD2	GHI	DVX-10000	
<input type="checkbox"/> MD	ABC	DVX-10000	
<input type="checkbox"/> PC	CANNOT BE OPERATED		

DECIDE

RETURN

Fig. 7A

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SET EQUIPMENT		
<input checked="" type="checkbox"/> D-VHS1	ABC	DVX-10000
<input checked="" type="checkbox"/> D-VHS2	DEF	
<input checked="" type="checkbox"/> D-VHS3	GHI	DVX-10000
<input type="checkbox"/> D-VHS	ABC	DVX-10000
<input type="checkbox"/> D-VHS	DEF	
<input checked="" type="checkbox"/> MD1	ABC	DVX-10000
<input checked="" type="checkbox"/> MD2	GHI	DVX-10000
<input type="checkbox"/> MD	ABC	DVX-10000
<input type="checkbox"/> PC CANNOT BE OPERATED		

DECIDE

RETURN

Fig. 7B

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SET EQUIPMENT		
<input checked="" type="checkbox"/> D-VHS1	ABC	DVX-10000
<input type="checkbox"/> D-VHS	DEF	
<input checked="" type="checkbox"/> D-VHS3	GHI	DVX-10000
<input type="checkbox"/> D-VHS	ABC	DVX-10000
<input type="checkbox"/> D-VHS	DEF	
<input checked="" type="checkbox"/> MD1	ABC	DVX-10000
<input checked="" type="checkbox"/> MD2	GHI	DVX-10000
<input type="checkbox"/> MD	ABC	DVX-10000
<input type="checkbox"/> PC CANNOT BE OPERATED		

DECIDE

RETURN

Fig. 7C

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SET EQUIPMENT		
<input checked="" type="checkbox"/> D-VHS1	ABC	DVX-10000
<input type="checkbox"/> D-VHS	DEF	
<input type="checkbox"/> D-VHS3	GHI	DVX-10000
<input type="checkbox"/> D-VHS	ABC	DVX-10000
<input type="checkbox"/> D-VHS	DEF	
<input checked="" type="checkbox"/> MD1	ABC	DVX-10000
<input checked="" type="checkbox"/> MD2	GHI	DVX-10000
<input checked="" type="checkbox"/> MD3	ABC	DVX-10000
<input type="checkbox"/> PC CANNOT BE OPERATED		

DECIDE

RETURN

Fig. 8A

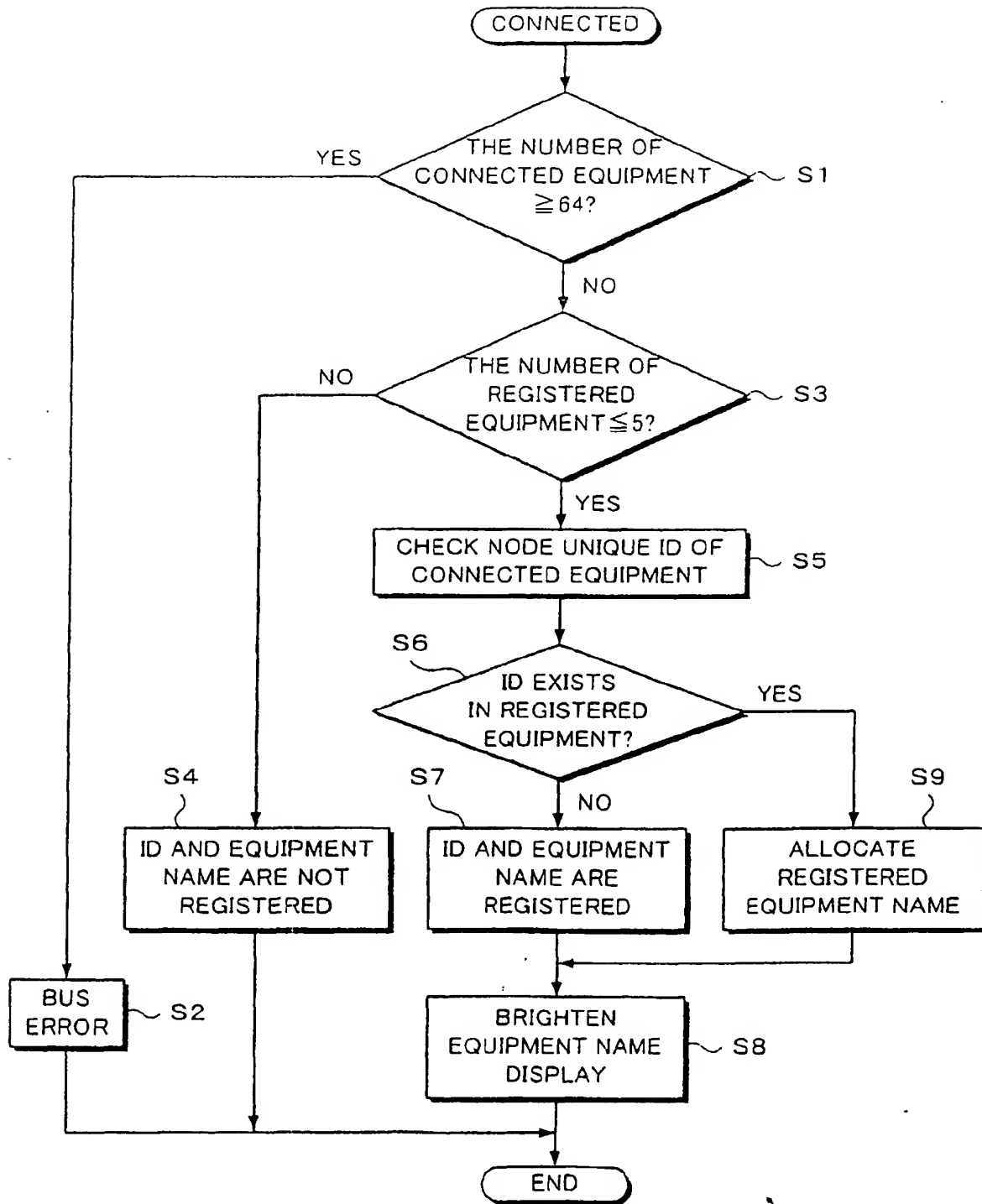


Fig. 8B

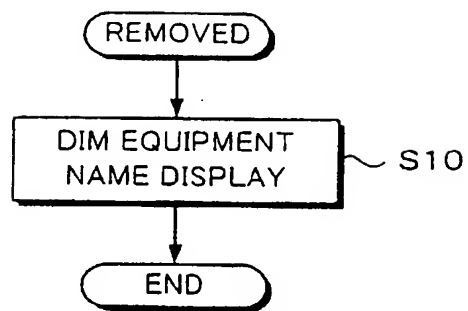


Fig. 9

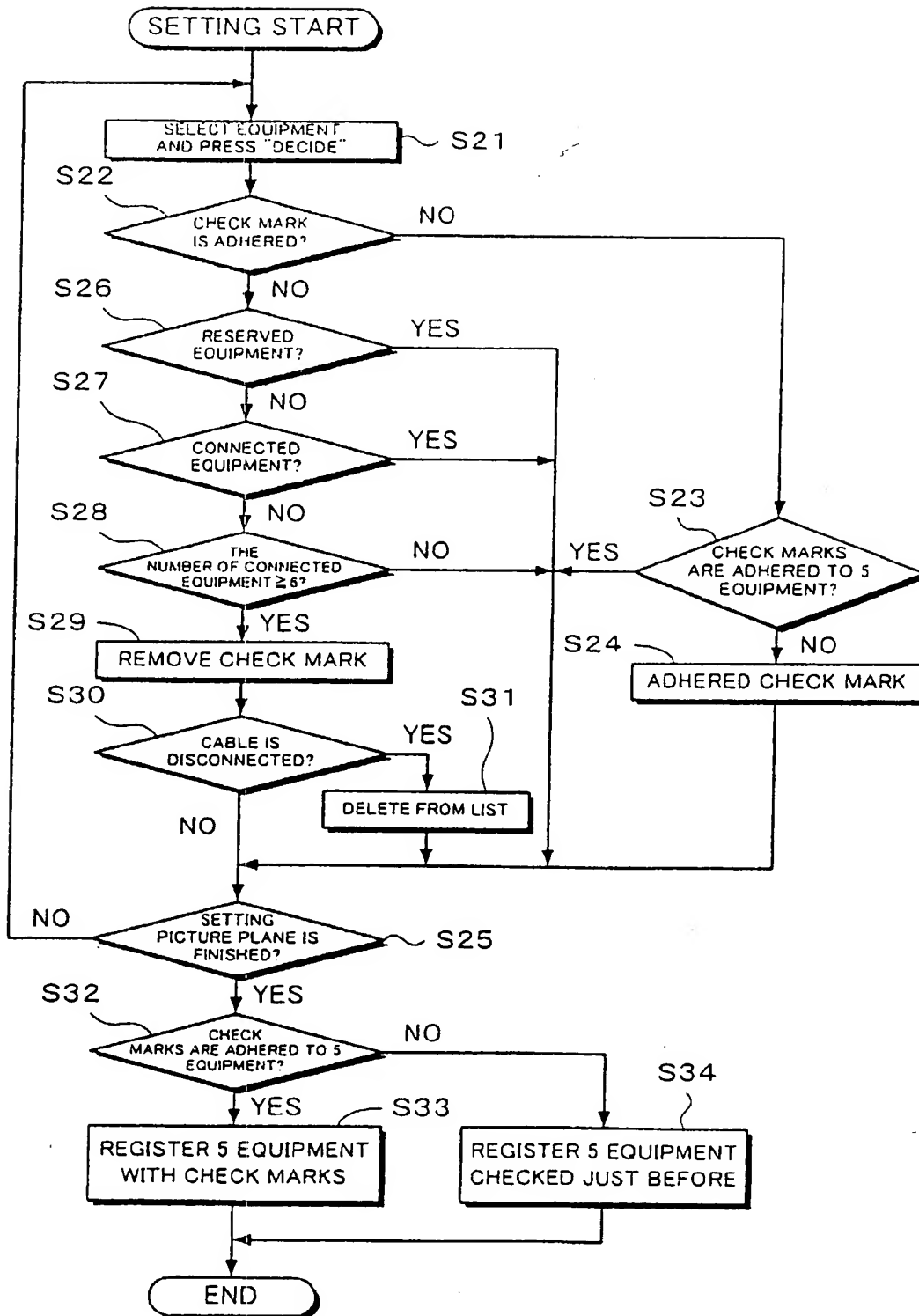



Fig. 10

i.LINK INITIAL SET


RETURN


 INFORMATION

INITIAL SET OF i.LINK


TURN ON POWER OF PARTNER EQUIPMENT UPON CONNECTION

☐ POWER ON
☐ DO NOTHING


 VARIOUS SETTING


SET INPUT OF PARTNER EQUIPMENT INTO i.LINK UPON CONNECTION




☐ i.LINK INPUT
☐ DO NOTHING





 RESERVATION SETTING

i.LINK BUS OUTPUT UPON NON-CONNECTION

☐ MPEG STREAM
☐ PCM AUDIO


 INITIAL SET

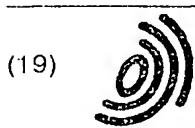




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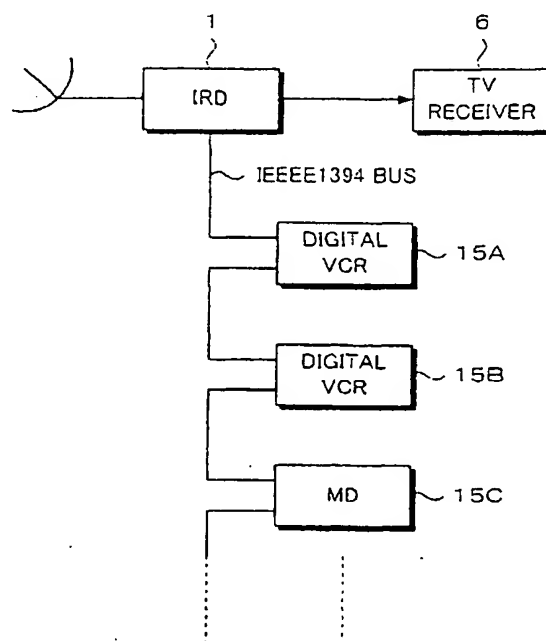
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(54) **Receiving systems, methods and apparatus for digital broadcasting**

(57) In a system in which an IEEE1394 interface is provided for an integrated receiver decoder (IRD), connected equipment can be easily selected and the operability is improved. Data can be transmitted among the equipment. For example, five equipments (15A, 15B, 15C, etc.) may be selected from the equipment connected to the IEEE1394 interface and node ID numbers are allocated to the five equipments and registered. Thus, even if the equipment is removed from the interface and connected again, the IRD (1) can recognize the equipment. Further, a number of equipments are not arranged on the list display of the connected equipment and desired equipment can be easily selected. Among the equipments physically connected to the interface, the five equipments which were connected early are automatically registered. The registration can be easily changed by a user input. When the registration is changed, the change of the registration is inhibited among the equipment in which the program reservation has been set or the connected equipment. Thus, even if the registration is changed, an erroneous operation does not occur.

Fig. 4





European Patent
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EUROPEAN SEARCH REPORT

Application Number
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A	* figures 1-4,11,15 * * column 3, line 29 - column 5, line 21 * * column 13, line 12 - column 14, line 58 *	3,6,8,9, 13,16, 18,19	
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A	* abstract * * page 10, line 5-32; figures 5-7,9 * * page 21, line 1-5 * & US 5 883 621 A (IWAMURA RYUICHI) 16 March 1999 (1999-03-16)	5,6,9, 15,16,19	
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 17 April 2003	Examiner McGrath, S
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